

submits that the present amendment does not raise any new issues for consideration by the Examiner because claims 18-19 are merely modified to correct an inadvertent inconsistency.

Applicant also respectfully submits that the Examiner's rejection of claims 18-19 under 35 USC §112, first paragraph, set forth at the top of page 2 of the Office Action is overcome by the above amendments, and accordingly it is respectfully requested that the rejection be reconsidered and withdrawn.

#### **ART-BASED REJECTIONS OF THE CLAIMS**

The above-identified Office Action has been reviewed, the references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present amendment is submitted. It is contended that by the present amendment and arguments, all bases of rejection set forth in the Office Action are traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

#### **Summary of the Examiner's Position in the Office Action**

In the above-identified Office Action, the Examiner has rejected claims 1-5 and 7-17 under 35 USC §103(a) as being unpatentable over Iwamoto (US Patent 5,324,645) in light of Maggard (U.S. Patent No. 5,145,765); and has rejected claim 6 under 35 USC §103(a) as being unpatentable over Iwamoto and Maggard in light of Anderson (U.S. Patent No. 5,502,560).

It is the Examiner's position, as essentially maintained from the prior Office Action, that Iwamoto substantially teaches the invention as claimed, including temperature control means for stabilizing the sample temperature, except that he does not teach that his method/apparatus is useful for the analysis of liquid samples, the use of test tubes as sample cells in the analysis of liquids or use of a white light source and diode array; that the analysis of liquid samples using near infrared spectroscopy is well known, such as taught by Maggard, so that it would have been obvious to persons of ordinary skill in the art at the time of the invention to modify Iwamoto's method/apparatus to analyze liquid samples; that the use of test tubes is well known in the art of analysis, so that it would have been obvious to persons of ordinary skill in the art at the time of the invention to further modify Iwamoto's

method/apparatus to use test tubes as sample cells for liquid samples; and that it would have been obvious to use a plurality of test tubes with the same characteristics for the advantage of predictable results; and that it would be obvious to use a white light source or diode array as a light source in Iwamoto's apparatus based on the teachings of Anderson.

Further, in response to applicant's arguments in the Amendment-B the Examiner argues that: the proposed use of Iwamoto's NIR spectrometry relative to liquid samples is not based on impermissible hindsight, but is based on motivation from Maggard's teachings of using NIR spectrometry relative to liquid samples, as well as from Iwamoto's teaching that his method provides accurate results; Iwamoto and Maggard are analogous art, both coming from the field of infrared analysis; and that it is well known in the art of spectroscopy to use test tubes and to measure a plurality of sample characteristics using same.

#### Applicant's Response

Upon careful consideration and in light of the above amendments to the claims, applicant respectfully submits that the Examiner's rejection is overcome and that each of the present claims is clearly patentably distinct over the Iwamoto and Maggard references, for substantially the same reasons as were presented in Amendment-B.

Again, applicant respectfully submits that the proposed modification - combination of Iwamoto's method/apparatus relative to select features of Maggard's method of determining aromatic content of hydrocarbons is improperly based on suggestions coming entirely from the Examiner (as guided by impermissible hindsight of applicant's disclosure), rather than from any permissible hindsight (such as discussed in *In re McLaughlin*) based on teachings or suggestions which may be fairly gleaned from the references themselves; and because neither reference discloses or suggests features of the claimed invention, or achieves the advantages achieved by the present invention.

Relative to the proposed modification, Iwamoto's disclosed method is a specific nondestructive NIR measurement of a single characteristic (the sugar content) of *whole fruit having thick skins* (e.g., mandarin oranges, watermelons and melons), which *requires* determination/use of a reference wavelength at which a nearly linear relationship exists

between the size of the fruit and the NIR light absorbance thereof, normalization of the measured absorbance at the reference wavelength to account for fruit size, and a model for comparison to a detected absorbance generated using multiple regression analysis and measurements of actual fruit sweetness made using a refractometer. Iwamoto explains that reference wavelengths for his method are in a shorter wavelength region ( $< 1000\text{nm}$ ), e.g., the reference wavelength for mandarin oranges is  $844\text{ nm}$ , because the radiation with such wavelengths has a comparatively *strong penetrating capability necessary in relation to thick skinned fruits*. Iwamoto somewhat corresponds to the disadvantageous and limited method of Japanese Unexamined Patent Publication No. Hei 11-44638 discussed in the background of the present application.

Quite differently, although Maggard's method involves use of NIR radiation and measurement of a single characteristic similarly to Iwamoto (aromatic content of a mid-distillate hydrocarbon fuel such as diesel fuel), it is clear from the full disclosures of the two references that Maggard's method is *very distinct from and incompatible with* that of Iwamoto in most respects. For example, Maggard's method specifically involves determining the *aromatic content of a liquid hydrocarbon fuel*, rather than *sugar content of whole fruit*. Further, he uses a two point calibration/standardization and the Beer-Lambert Law (involving processing of a reference liquid sample via HPLC to separate it into an aromatics and non-aromatics fractions, performing NIR measurements of the separated portions at preferred wavelength in the ranges  $1650\text{-}1700\text{nm}$  and  $2120\text{-}2256\text{nm}$ , respectively, and deriving a calibration equation and its constants using Beer-Lambert's Law or the like), rather than a multiple regression analysis as used by Iwamoto. Still further, given the light wavelengths used by Maggard, which are above  $1100\text{nm}$ , it is *necessary that he use a special crystal sample cell* for containing his liquid samples, rather than an ordinary test tube, as discussed in the background of the present application.

Given the specific teachings of the references, persons of ordinary skill in the art would not consider it obvious to use the method of Iwamoto to measure multiple physical properties of liquids in general, as proposed by the Examiner, because the references provide

no motivation or reason for doing so. Each of the references discloses a method which is specifically suited to measurement of a single specific characteristic of a given substance (sugar content of whole fruit with thick skins or aromatics content of liquid hydrocarbon distillates), and there is no indication by either reference that the specific method disclosed therein could be used to measure a different characteristic of a completely different material.

In this regard, and as discussed in the *In re McLaughlin* case, a proposed modification must be based on knowledge which was within the level of ordinary skill at the time of the claimed invention. It is respectfully submitted, however, that the proposed modification of Iwamoto does not satisfy this requirement. Apart from the fact that Iwamoto's method/apparatus are not constructed or intended for use in measuring liquid samples, Maggard specifically requires use of a flow through cell, which is not a test tube. Also, given that Maggard uses of NIR wavelengths of 1650-1700nm and 2120-2256nm, if his system were hypothetically modified to make static measurements, his system would necessarily use special crystal sample cells according to conventional practice as discussed in the background of the present application, contrary to the use of test tubes as defined in independent claims 1 and 5. The short wavelength range used by Iwamoto specifically pertains to the fact that he is measuring thick skinned fruit, and the wavelength range has a strong penetrating ability relative to the skin, such that the reference provides no reason to apply the wavelength range to a liquid sample. Further, neither reference (nor any other evidence of record) indicates that *multiple* characteristics of a liquid sample would be measured using the NIR spectroscopy, contrary to the requirement of claims 1 and 5. Rather, Iwamoto measures only sugar content and Maggard measures only aromatics content. Still further, there is never any teaching by the references (or other evidence) that the liquid sample measured is an unmodified field sample as required by claims 16-17. Iwamoto does not measure liquid samples, Maggard's method involves petroleum distillate further separated into fractions via HPLC, while the conventional practice was (prior to the present invention) to remove impurities from and homogenize the liquid samples prior to

measurement, which is a huge disadvantage in making field measurements as also discussed in the background of the present application.

Moreover, even if the teachings of Iwamoto and Maggard were hypothetically combined, applicant respectfully submits that any combination resulting from the full, fair teachings of the references would not achieve or make obvious many features of the the invention as claimed, nor would any combination achieve the significant advantages which are achieved by the claimed invention.

Again, neither Iwamoto or Maggard use of ordinary test tubes for containing the sample liquid and the reference liquids as set forth in independent claims 1 and 5, as discussed above, whereas this is a very important aspect of the invention, permitting it to be used in practical, efficient field measurements. Relatedly, dependent claims 4, 11, 12, and 14 further define the ordinary and interchangeable nature of the test tubes used for holding the sample and reference liquids, an advantageous feature not taught or suggested by the references. Further, neither of the references discloses or suggests disclose a method/control means for determining (plural) *object characteristics* of a sample, as defined in independent claims 1 and 5. Rather, each reference discloses a method in which only one characteristic is measured, i.e., sugar content or aromatics content. As discussed in the background of the present application, this distinction is a significant drawback of the prior methods.

Further, the references do not disclose or suggest: a temperature control means for controlling temperature of the liquid sample as set forth in claim 9 (the Examiner's reference to Iwamoto's temperature controlled sensor is inappropriate because the sensor does not control the temperature of a fruit being measured, but the temperature of the sensor); use of NIR light having a wavelength of 700-1100nm for a liquid sample as defined in claim 2, use in relation to materials as defined in claim 3; analysis involving unmodified field samples as defined in claims 16-17 (noting that Maggard analyzes distilled hydrocarbons); an optical path length of 1-2 cm as defined in claims 18-19; etc.

In this regard, applicant respectfully traverses the Examiner's various allegations set forth in the Office Action (rejections and rebuttal) because they are not supported by the

disclosures of the references or by any other evidence of record. For example, in relation to the proposed modifications to Iwamoto's method, there is no reason/motivation to generally apply Iwamoto's method to any liquid sample, as the Examiner asserts, because a hydrocarbon distillate having two basic portions (aromatics and non-aromatics) is not the same as other liquids, such as those defined in claim 3, the method of Iwamoto is not as precise as that of Maggard (involving HPLC), etc. Still further, the Examiner's allegation regarding "well known" use of test tubes for liquid analysis is not a proper basis for rejection because the claimed invention does not generally relate to liquid analysis, but instead involves NIR analysis, and it is known/conventional that special crystal sample cells are used for NIR analysis using wavelengths above 1100nm, as discussed in the background of the present application. It was not well known to use test tubes or ordinary test tubes for NIR analysis of liquids as claimed, nor has the Examiner presented any evidence to support his allegation.

Finally, applicant respectfully submits that the claimed invention has proven to be commercially successful based on its discussed advantageous features which make it very efficient and practical for use in field applications. Particularly, the claimed invention is now widely used in Japanese producer markets because its increased efficiency is very important when a quick analysis is required in an agricultural or factory environment.

Based on the foregoing, applicant respectfully submits that the rejection of claims 1-19 under 35 USC 103(a) as unpatentable over Iwamoto in light of Maggard or Maggard and Anderson are overcome, and accordingly it is respectfully requested that such rejections be reconsidered and withdrawn.

#### Newly Cited Art

Applicant has considered the Kester et al. reference (US Patent 6,339,222) cited by the Examiner at page 8 of the Office Action, but it is respectfully submitted that this reference fails to overcome the deficiencies of the Iwamoto and Maggard references relative to the present claims as discussed above.

#### Conclusion

Applicant respectfully suggests that none of the references of record, considered either singly or in any combination, teach applicant's invention, as presently claimed, and that further, skill generally available in the art would not lead to a person of ordinary skill to create applicant's claimed invention, using the references of record. Applicant respectfully suggests that as presently amended, all of the pending claims are believed to be allowable, and a notice to this effect is earnestly solicited.

For all of the above mentioned reasons, applicant requests reconsideration and withdrawal of the rejections of record, and allowance of all the pending claims.

Entry of the present Amendment is respectfully requested under 37 CFR § 1.116 on the grounds that the amendment : merely overcomes an inadvertent inconsistency, without raising any new issues for consideration; reduces the number of issues on appeal, if necessary; and moreover, is believed to place the application in condition for allowance.

If the Examiner is not fully convinced of all of the claims now in the application, applicant respectfully requests that she telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

Respectfully submitted,

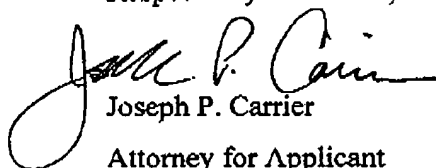
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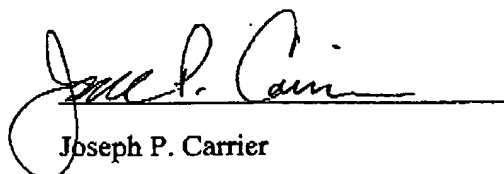
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Joseph P. Carrier

## MARKED UP VERSION TO SHOW CHANGES MADE TO CLAIMS 18-19

18. (Amended) The analytical method for analyzing a liquid sample using near infrared spectroscopy according to claim 1, wherein an optical path length for the near infrared light in the short wavelength range is 1-2 cm.

19. (amended) The analytical apparatus for analyzing a liquid sample according to claim 5, wherein an optical path length for the near infrared light in the short wavelength range is 1-2 cm.

## CLEAN VERSION OF AMENDED CLAIMS

18. (Amended) The analytical method for analyzing a liquid sample using near infrared spectroscopy according to claim 1, wherein an optical path length for the near infrared light in the short wavelength range is 1-2 cm.

19. (amended) The analytical apparatus for analyzing a liquid sample according to claim 5, wherein an optical path length for the near infrared light in the short wavelength range is 1-2 cm.